



CASE STUDY SUMMARY

The building at 50 Douglas Drive was one of the first county buildings to install the enhanced HVAC control system.

- Participant:
Contra Costa County
- Building Type:
Government, Small Office
- Site Size:
90,782 ft²
- Number of Occupants:
250
- Project Cost:
\$302,000
- Baseline Peak Demand:
500 kW
- Load reduction capability:
100 kW
- Primary Benefit:
Centralized thermostat control

Contra Costa County saves money and energy with enhanced automation systems in 30 buildings.

Installing an enhanced building automation system allows Contra Costa County engineers to monitor and control building HVAC systems in more than 30 buildings from a central Web server. The system responds automatically to external demand events and price signals, raising the temperature slightly to ease the cooling load. Due to successful load reduction and occupant satisfaction in several county buildings, the county plans to install this control system in all major facilities to centralize building control and enable up to 1 MW of load reduction.

- High energy costs
- Wanted to participate in demand response but needed contacts

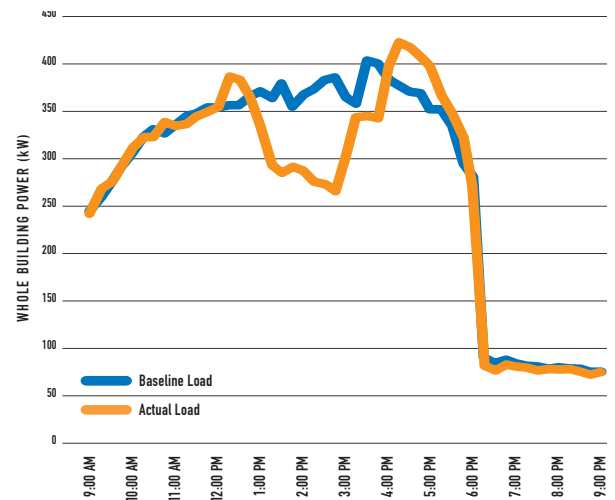
PROBLEM

Contra Costa County spends over \$10 million on energy annually, paying over 900 Pacific

Gas & Electric Company (PG&E) accounts at more than 400 facilities. To act as a responsible government agency and reduce energy costs, the county developed a Strategic Energy Plan, which includes using demand response when energy costs are high.

The building at 50 Douglas Drive in Martinez houses the Probation Department and Child Support Services. A 123 kW photovoltaic system was installed in 2002. Additionally, the county wanted to further reduce demand at peak times while making it easier for the facility manager to respond to user requests for temperature changes

Electrical Demand at 50 Douglas Drive



The graph above compares energy demand on an October day at the 50 Douglas building. The building saved 100 kW without any customer complaints. While the building experienced a rebound at 4:00 p.m. when electricity prices returned to normal, the system has since been set to stage the return avoiding snapback. Source: 2004 Demand Response Tests in Large Facilities, Piette, et. al. (<http://drrc.lbl.gov/drrc-pubs1.html#project>).

- Automated control of HVAC system
- Centralized control of zone thermostats
- Partnership in voluntary demand response program

SOLUTION

To allow centralized control and quick demand

response, Contra Costa County installed an enhanced building management system to control heating and cooling at 50 Douglas Drive. The county purchased and installed Alerton's Building Automation and Control network (BACnet) based system, which allows zone level control, increasing the facility manager's capability to control air temperature in each building area. Alerton programmed a global thermostat set point adjustment shed strategy to raise indoor air temperature to respond to energy price increases during demand events. Alerton's BACnet system is now standard in the county-wide system, providing centralized control to all major facilities. The system is being integrated in both renovations and new construction.

"The county is completely supportive of energy efficiency and is willing to make sensible investments to attain it. Our energy reduction efforts have also made an impact during this era of tight government budgets."

"The building management system allows us to operate the HVAC more efficiently. Because the system responds so well to demand reduction, we will include more buildings in demand response programs next year."

Andy Green,
Contra Costa County Energy
Program Manager



"We've been very happy with this system; the results of the [Lawrence Berkeley National Laboratory] test were very positive and showed what our facilities have the potential to do. We are also examining ways to incorporate lighting control into the building management system so it, too, becomes part of energy and demand response programs."

- Energy cost savings
- Centralized control
- Automatic response to real-time pricing
- Access to real-time data

BENEFITS

The 50 Douglas building is now able to shed approximately 100 kW or 20 percent of its demand with fully automated response. Despite significant energy savings, no employee complaints have been received. This also allows the County to participate in PG&E's Critical Peak Pricing program, adding to the financial benefit for the county. Because the 50 Douglas building is fully automated, the system responds automatically to price changes, requiring no staff time. The enhanced automation system also provides the county with real-time energy use data, informing facility management decisions.

Additionally, because the system can be operated remotely, operations are streamlined. The building management system allows staff to oversee and make adjustments to building systems without a physical presence, allowing staff to direct efforts to more immediate needs. The system also enables the county to develop pre-cooling strategies to maintain comfort during longer demand response events.

PROJECT SITE DESCRIPTION

- Location: 50 Douglas Drive, Martinez, CA
- Size: 90,782 ft²
- Space Function: Office
- Site Contact: Andy Green, Contra Costa County Energy Program Manager

Equipment Installed

- Alerton's BACnet with Direct digital controls to the zone level
- PG&E's InterAct online interval metering program

Energy Usage

- Summer Peak Demand: 500 kW
- Curtailable Peak Load: 100 kW
- Project cost: \$302,000
- Project incentives: \$37,450



Technical Information

Contra Costa County has made Alerton's version of the ASHRAE BACnet protocol the standard enhanced automation system. Currently, this energy management and control system (EMCS) is used solely for HVAC control, although eventually the county will add lighting controls to the system.

At 50 Douglas Drive, the EMCS controls three packaged rooftop air handler units with direct exchange cooling. These units allow for quick temperature changes, making it an ideal system for demand response. Alerton's BACnet includes a Graphical User's Interface, which

enables the facility manager to easily access the control system, improving operations.

The Alerton system maintains space cooling at 76 degrees and heating at 68 degrees, scheduled to run Monday through Friday from 5:00 a.m. to 6:00 p.m. This system directly controls the refrigeration compressors to operate and stage cooling capacity

to maintain discharge air temperature. The system also allows for outside temperature lock out to avoid heating and cooling simultaneously. Both the central and zone level controls utilize the Alerton system, though the central control was installed first and the zone system added a year later.

Under PG&E's Critical Peak Pricing (CPP), the 50 Douglas building is automated to respond to two increases in price, first from noon to 3:00 p.m. and then from 3:00 to 6:00 p.m. Each increase is sent over the Internet. Each time a signal is received, EMS responds automatically by raising the temperature two degrees. The chillers and fans curtail, easing load and creating immediate demand response.

Because all the controls are preconfigured, the system responds to CPP in a fully automated fashion. This provides reliable demand response for the utility and saves the county money. At the 50 Douglas building, the warmer temperatures on demand response days have been accepted without complaint from occupants.

In the Fall of 2005, the 50 Douglas building participated in a study on demand response conducted by Lawrence Berkeley National Laboratory. The building demand reductions amounted to 31 percent of whole building power, or demand savings of 1.34 watts per square foot. Further information on the demand response research is available in Development and Evaluation of Fully Automated Demand Response in Large Facilities, M.A. Piette, O. Sezgen, D. Watson, N. Motegi, (Lawrence Berkeley National Laboratory), C. Shockman (Shockman Consulting), L. ten Hope (Program Manager, Energy Systems Integration CEC). CEC-500-2005-013. January 2005. (<http://drcc.lbl.gov/drcc-pubs1.html#project>).

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TAKING THE NEXT STEP

A list of certified demand response contractors is available at:
www.energy.ca.gov/demandresponse/documents/qualified_firms.html

Free resources are available from the California Energy Commission at:
www.energy.ca.gov/enhancedautomation/

- Business Case Guidebook
- Technical Options Guidebook
- Case Studies

- 1 Alameda County
- 2 Hewlett-Packard
- 3 Comerica Building
- 4 Foothill-De Anza Community Colleges
- 5 Staples, Inc.
- 6 Doubletree Hotel Sacramento
- 7 Albertsons
- 8 Arden Realty/next>edge
- 9 Contra Costa County
- 10 Hilton, Palm Springs
- 11 PETCO
- 12 Swinerton Inc.

Research on Demand Response:

- <http://drcc.lbl.gov/drcc-1.html>

Additional Resources:

- www.fypower.org/now/demand_resp.html
- www.sdge.com/business/dr/index.shtml
- www.pge.com/biz/demand_response/
- www.sce.com/RebatesandSavings/LargeBusiness/DemandResponse/